Computer Assignment - 2

Group - 2

(a) Given objective function

$$f(w) = \frac{1}{N} \cdot \sum_{i \in N} f_i(w) + \lambda \|w\|_2^2, \quad -(1)$$

where,

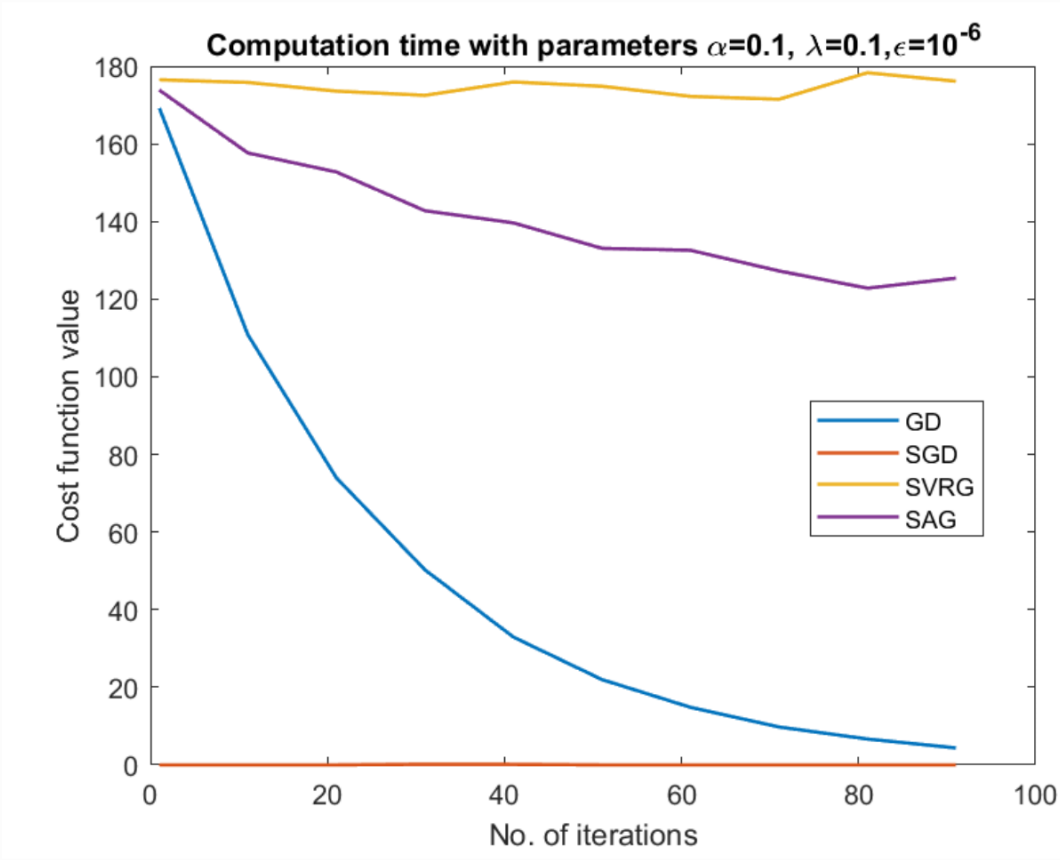
$$f_i(w) = \log\left(1 + \exp\left(-y_i w^T x_i\right)\right)$$

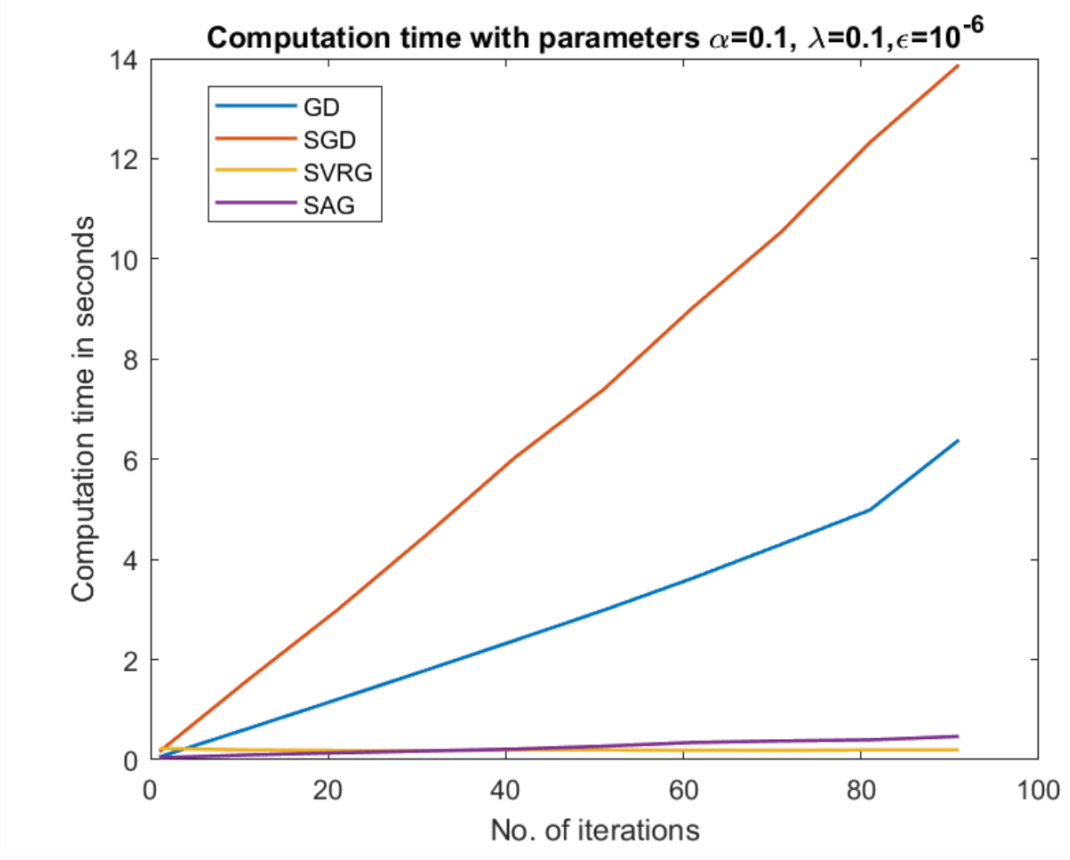
$$\Rightarrow f(w) = \frac{1}{N} \cdot \sum \log\left(1 + e^{-y_i w^T x_i}\right) + \lambda \|w\|^2$$

Apply gradient

$$\Rightarrow \nabla f(w) = \frac{1}{N} \cdot \sum \frac{-y_i x_i e^{-y_i w^T x_i}}{1 + e^{-y_i w^T x_i}} + 2\lambda w$$

$$= \frac{1}{N} \cdot \sum \frac{-y_i x_i}{1 + e^{y_i w^T x_i}} + 2\lambda w$$


Computation time with parameters α=0.1, λ=0.1,ϵ=10^{-6}
Cost function value
No. of iterations
GD
SGD
SVRG
SAG
0
20
40
60
80
100
120
140
160
180


Computation time with parameters α=0.1, λ=0.1,ϵ=10^{-6}
Computation time in seconds
No. of iterations
GD
SGD
SVRG
SAG
0
2
4
6
8
10
12
14
20
40
60
80
100

Hyper parameter tuning :

Top 10 results:

alpha	lambda_	num_iters	epsilon	cost_gde	cost_sgd	cost_svrg	cost_sag	time_gde	time_sgd	time_svrg	time_sag
0.100000	0.100000	300	0.000100	0.000392	0.004641	0.017570	0.006766	20.721717	42.143109	0.206133	1.432835
0.100000	0.100000	300	0.001000	0.000394	0.005241	0.017570	0.006766	15.013756	6.580632	0.209690	1.405369
0.100000	0.100000	200	0.001000	0.000396	0.006035	0.017570	0.009979	13.763221	3.715651	0.199387	0.949640
0.100000	0.100000	200	0.000100	0.000396	0.002623	0.017570	0.009979	13.900473	27.982242	0.204477	0.980473
0.100000	0.100000	200	0.010000	0.000626	0.001046	0.017570	0.012941	7.079549	0.055965	0.209123	0.378876
0.100000	0.100000	300	0.010000	0.000626	0.000516	0.017570	0.012939	7.080453	0.096819	0.210741	0.363687
0.100000	0.100000	100	0.010000	0.000656	0.000502	0.017570	0.012949	7.159065	0.032792	0.193652	0.390999
0.100000	0.100000	100	0.001000	0.000656	0.004741	0.017570	0.015291	6.972905	2.104182	0.189943	0.503209
0.100000	0.100000	100	0.000100	0.000656	0.000633	0.017570	0.015291	6.906159	13.977381	0.188102	0.498284
0.100000	0.010000	300	0.001000	0.000707	0.000264	0.001871	0.001482	20.906364	0.276488	0.208747	1.432071